

REMARKS

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

I. CLAIM STATUS AND AMENDMENTS

Claims 1-33 were pending in this application when last examined.

Claims 30-33 were indicated as allowed. Applicants appreciate the Office's indication (in item 17 on page 8) that claims 30-33 are allowable.

Claims 1-7, 11-21 and 26-29 were rejected.

Claims 8-10 and 22-25 were objected, but indicated as allowed if rewritten in independent form.

Claim 1 is amended along the lines of allowed and granted claims in the corresponding European application, EP 1 560 687B1. Support can be found in the instant disclosure, for example, at page 12, lines 1-23 and in original claim 1.

Claim 7 is amended to incorporate dependent claim 8 (indicated as allowable if rewritten in independent form).

Claims 8 and 20 have been cancelled without prejudice or disclaimer thereto. Applicants reserve the right to file a continuation or divisional on any cancelled subject matter.

Claims 9-10 are amended to change their dependency so they depend on amended claim 7.

Claims 12 and 28 are amended to remove lack of antecedent basis issues raised in the Office Action. Support can be found in the claims as filed.

The remaining claims have been amended in a non-narrowing manner to better conform to U.S. practice for antecedent basis. Support can be found in the claims as filed.

No new matter has been added by the above-noted claim amendments.

Claims 1-7, 9-19 and 21-33 are pending upon entry of this amendment.

The specification at page 5, lines 12-14 has been amended to remove improper references to one or more claims.

The specification has also been amended to include an Abstract to the disclosure. Support for such can be found at page 1, lines 1-9 and claim 1.

No new matter has been added by the above amendments to the disclosure.

II. OBJECTIONS TO THE SPECIFICATION

The specification was objected for referencing a claim on page 5, lines 12-14 for the reasons in item 5 on page 3 of the Office Action.

In item 6 on page 3 of the Action, the specification was objected for not containing an Abstract.

The present amendment overcomes these concerns by: (1) amending the specification, at page 5, to remove reference to claims; and (2) amending the specification to include an Abstract.

Thus, withdrawal of the above objections is solicited.

III. INDEFINITENESS REJECTION

Claims 12-13, 20, 26 and 28 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons in item 9 on pages 3-4 of the Office Action.

Applicants respectfully traverse this rejection.

Claims 12 and 28 have been amended to eliminate insufficient antecedence issues.

Claim 20 has been cancelled thereby obviating the Office's concern that it was a substantial duplicate to claim 7.

As to Office's concern of claim 26, this claim is not a substantial duplicate of claim 7. Instead, claim 26 further specifies the elements of claim 7 by defining the feeding chamber (15) and the "inlet apertures" as being inside the body (10).

Claim 1 has been amended to better define the subject matter more clearly and distinctively in a non-narrowing manner.

The claims are thus clear, definite and have full antecedent basis.

This rejection is believed to be overcome, and withdrawal thereof is respectfully requested.

IV. PRIOR ART REJECTIONS

Claims 1, 3, 5-7, 11-21, 26, 27 and 29 were rejected under 35 U.S.C. § 102(b) as anticipated by SCHULTE et al. (U.S. 4,141,470) for the reasons in item 11 on pages 4-7 of the Office Action.

Claims 3-4 were rejected under 35 U.S.C. § 103(a) as being obvious over SCHULTE et al. (U.S. 4,141,470) in view of BAUER (U.S. 4,510,120) for the reasons in item 14 on pages 7-8 of the Office Action.

These rejections are respectfully traversed and will be discussed together below.

To start, it should be noted that claim 7 has been amended to incorporate dependent claim 8. Claim 8 was not included in this rejection. In fact, in item 16 on page 8, it was indicated that claim 8 was objected to, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. It should also be noted that claims 9-10 have amended to change their dependency so they depend on amended claim 7. Thus, claim 7 should now be allowable and patentable over the cited references. Accordingly,

the rejections should be withdrawn as they no longer apply to claim 7 and dependent claims 9-19, and 21-29 (all dependent on claim 7).

Nonetheless, Applicants respectfully traverse the rejection as applied to claims 1-6 relating to the method per se.

First, Applicants believe that the Office has not correctly appreciated the innovative features of the new method and apparatus for mixing reactive polyurethane chemical components, according to present application. To this purpose, Applicants will first present a discussion to try to better clarify the innovative features of the claimed method, how the apparatus is working, and relative advantages in respect to a usual high pressure mixing device (HP).

The mixing apparatus according to present invention, hereunder also referred to as "JL mixhead", pertain to a new family of high pressure mixing device, particularly suitable for polyurethane mixtures.

The acronym JL stands for "Jet Less" to say that the mixing of the two reactive liquids is not obtained merely by impingement of the chemicals fed by two injectors, usually present in the conventional mixheads. The feeding of the chemicals in a common chamber in which the chemicals substantially are maintained at a same pressure and in an unmixed condition and the high turbulence - formed and maintained in a relatively narrow mixing chamber in which a stream of the two

components is delivered - does the trick. The liquid components are metered in a common chamber and then flow in an unmixed condition to the mixing chamber through variable restrictions where they acquire the necessary energy. At the end of the mixing chamber the flow is fed into a much larger delivery chamber, slows down its turbulence and permits the delivery of the mixed blend with a very laminar flow.

HOW DOES IT WORK? - The mixing of at least two fluids is normally performed through turbulence as in usual mixheads.

There are many ways to create or maintain turbulence: static mixers, dynamic mixers, high speed of the streams and jets, impingement of jets and streams. All of them try a different way to maintain a high level of energy dissipation throughout shear into the fluid.

Now imagine in a mix head to decrease the size of the mixing chamber 22 enough to generate a flow speed of tenth of meters per second, and to use the front shape of the pin 29 (which seals the mixing chamber 21) to create high shear restrictions 31: the result is the Jet Less head, a mixing head whose geometry permits an intimate mixing and to reduce the turbulence of the flow exiting from the mixing chamber 24, and to pour it in laminar form. In the JL the mixing is performed by the combination of two co-axial chambers 15, 24: in a first annular chamber 15 the (at least) two reactive liquids are delivered in common by proper metering devices, and maintaining in a unmixed

condition at a same pressure; a large spool 12 is reciprocable within common chamber 15 and is provided with a shaped front surface 12A, 12B conforming to the bottom surface 14A, 14B of the same common chamber 15 (see fig. 3), positional at the rear end of the mixing chamber 24. By hydraulically driving the pin 29 and the spool 12 backwards we create an annular common chamber 15, a hollow cylinder with shaped top and bottom faces. The components flow into the common chamber 15 at a same pressure.

What is important is the size of the common chamber 15, which has the same center line of the spool 12 and of the related cleaning pin 29. This has cylindrical shape and slides free along the central line of the mentioned spool 12. The pin front - combined with the shaped faces, forms the restrictions. The unmixed components flow throughout these restrictions and reach the mixing chamber where they mix at high speed. The sharp-edged shape and the pressure in the common chamber originate and improve the mixing turbulence, which is combined and maintained along the mixing chamber. The central pin 29 is hydraulically controlled backward to perform the mixing or forward to clean the mixing chamber at the end of the injection.

The front position of the pin can be set manually acting on the stop device 32 to properly define the restrictions and adapt them to the flow rate so to create and maintain the acquired pressure in the common chamber 15.

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When the spool 12 is urged against the corresponding bottom surface 15, the mixed blend is squeezed out from the common chamber and this is perfectly cleaned.

With this solution the mixing chamber can be small as necessary and desired, while the restrictions create a very efficient and homogeneous turbulence and mixing.

Additionally a long and wide discharge duct 25A, 25B, features the JL whose main purpose is to dump the high speed and turbulence of the stream, to perform a final mixing and to smooth down the whirling of the stream. Leaving the head, the stream becomes laminar and can flow out into the mould with the ideal behaviour.

These head have been industrially tested with rigid and flexible foam for more than one year and with frequent shots (up to 60,000 in one month), with full satisfaction to this purpose. We enclose a coloured computer simulation (Exhibit 1) which clearly shows the working method of the mixing device according to this invention. You will see that both components A and B remain unmixed in the common pressure and feeding chamber 15; are co-injected and pre-mixed at the injection orifices 31, thereupon are intimately mixed in the mixing chamber 24; a post-mixing may occur in the discharging duct 25A.

ADVANTAGES - The new JL of the present invention head delivers several advantages:

- a mixing method much more efficient than the traditional impingement: the higher efficiency has been computer-studied and simulated, and confirmed by field tests - see exhibit 1;
- the feeding pressure for chemicals can be reduced to 70-80 bar depending from the same chemicals. This allows for the simplification of the whole metering circuit (pump, filters, hoses etc);
- a wider range of flow rates can be handled: the maximum output can be five times higher than the minimum;
- it does not demands skilled operators to set the head's injection conditions: an easy setting of the central pin suits a variety of flow rates; pre-positioning of different values can be done manually or in automatic mode;
- the use of the thin and long cleaning pin is mostly appreciated when using very sticky formulations; and
- the internal geometry allows for a better handling of foams expanded with high-frothing blowing agents.

With the new JL mixing device new concepts in the art of mixing Polyurethanes have again introduced.

With the above being said, it is further noted that claim 1 has been amended along the lines of allowed and granted claims in the corresponding European application, EP 1 560 687B1.

Applicants will now discuss the current rejections.

As to the 102(b) rejection over SCHULTE, it is respectfully submitted that SCHULTE does not disclose, suggest or make obvious the method according to amended claim 1 (which corresponds to allowed claim 1 of the corresponding EP patent EP 1 560 687B1). Again, claim 1 has been amended to conform to the allowed claims of the corresponding EP patent EP 1 560 687B1.

In particular, Applicants respectfully submit that SCHULTE does not disclose, suggest or otherwise support use of an annular chamber 4, or more properly of a chamber comparable to the annularly shaped common pressure and feeding chamber (15) of amended claim 1.

As can be seen from figure 3 of present application, the annular common chamber 15 is provided by the pin or throttling member 29 coaxially arranged to the mixing chamber 24 and defining, with the rear edges of the same mixing chamber 24, the injection restrictions 31.

The annular shape of the common chamber 15 due to the presence of central pin 29, play a relevant scope in preventing the impingement of the chemicals fed by orifices 16 and 17, and in maintaining said chemicals in an unmixed condition, at a same pressure, up to the injection into the mixing chamber 24.

Conversely, SCHULTE uses a cylindrical mixing chamber 4, in which the chemicals are injected to impinge and to be pre-mixed.

As such, chamber 4 of Schulte is not comparable in shape or purpose to the annularly shaped common pressure and feeding chamber (15) of amended claim 1. See, also claim 3 line 55 (bore 3 forms a mixing chamber 4).

Furthermore, in SCHULTE the restrictor 18 is arranged transversely to mixing chamber 4, while in the present application the restrictor pin 29 is arranged coaxially to the mixing chamber in order to:

- i) to clean the same mixing chamber in the advanced position;
- ii) to provide the restrictions in the retracted position;
- and
- iii) to provide the annular shape of the common chamber 15.

For these reasons, SCHULTE fails to disclose or suggest each and every element of amended independent claim 1. Thus, independent claim 1 (which is amended according to the allowed claims in the EP patent) is novel and patentable over SCHULTE. The mixing method and the geometry of the chamber in the mixing device according to present application completely differ from SCHULTE.

Claims 2 and 5 depend, either directly or indirectly on amended claim 1. Thus, these claims are also novel and

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patentable over SCHULTE for the same reasons in view of their dependency on claim 1.

Thus, the above-noted 102(b) rejection over SCHULTE is

Applicants also respectfully traverse the 103(a) rejection of claims 3-4 over SCHULTE et al. (U.S. 4,141,470) in view of BAUER for the same reasons set forth immediately above.

The above arguments with respect to SCHULTE and amended claim 1 are reiterated herein. Claims 3-4 depend, either directly or indirectly on amended claim 1. Thus, these claims are also novel and patentable over SCHULTE for the same reasons in view of their dependency on claim 1.

BAUER fails to remedy the above-discussed deficiencies in SCHULTE. In this regard, BAUER also fails to disclose or suggest the annularly shaped common pressure and feeding chamber (15) of amended claim 1.

For these reasons, claims 3-4 are novel and unobvious over the combination of SCHULTE and BAUER. Thus, the above-noted 103(a) obviousness rejection of claims 3-4 over SCHULTE and BAUER is untenable and should be withdrawn.

V. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and early notice to that effect is hereby requested.

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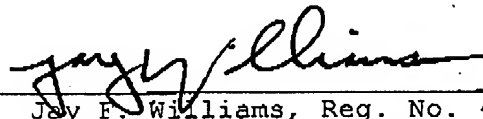
condition for allowance and early notice to that effect is hereby requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned attorney at the telephone number below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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APPENDIX:

The Appendix includes the following item(s):

- Abstract;
- field tests exhibit 1

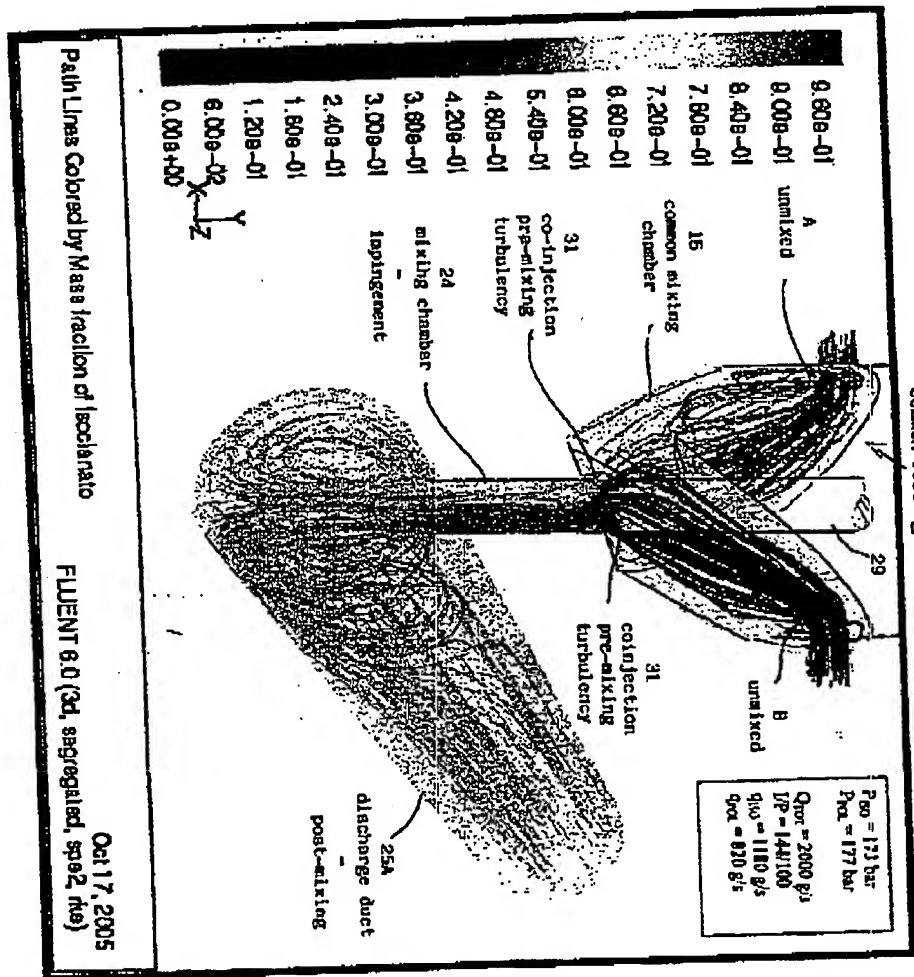


EXHIBIT 1